

INTRACRANIAL PRESSURE

- It is the pressure of brain tissue & thus of CSF with in the cranium.***
- Normal ICP is 10- 15 mmHg (136-204 mm H2O).***
- Normal CBF is 55-60 ml/ min./100gm brain tissue.***
- In the gray matter is 75 ml/min./100 gm brain tissue.***
- In the white matter is 45 ml/min./100 gm brain tissue.***
- Cerebral perfusion pressure (CPP) = mean arterial pressure – ICP.***
- CPP = (diastolic pr. + 1/3 of pulse pressure) – ICP.***

There are 3 major intracranial contents that affect ICP :

- 1) brain (70%) including interstitial fluid (10 %)-----
- 1400cc.*
- 2) blood (arterial & venous) (10 %)-----
150cc.*
- 3) CSF (10%)-----
150cc.*

*There are 3 major factors affect CBF under
physiologic conditions :*

- 1) systemic BP.*
- 2)CO₂ conc. & H ions in the arterial blood (most
potent stimulus).*
- 3) O₂ conc .*

Cerebral autoregulation

The ability to maintain CBF at a constant level over wide range of mean arterial pr. (50 – 160 mmHg), when the mean arterial prerssure is low , the cerebral arterioles dilates to allow adeguate flow & vice versa

When the mean arterial BP falls below 50 mmHg (as in hypovolemic shock) or above 160 mmHg (as in hypertensive encephalopathy), the cerebral autoregulatory system fails

Raised ICP

Persistent elevation of ICP more than 20mmHg.

Common causes of raised ICP

- 1) localized masses (hematoma , tumor , abscess, etc....***
- 2) obstruction to the CSF path. As in obstructive hydrocephaly.***
- 3) obstruction to major venous sinuses (cerebral venous thrombosis, depressed skull fracture over major venous sinus).***
- 4) diffused brain edema or swelling (diffused head injury, encephalitis , lead encephalopathy).***
- 5) idiopathic (pseudotumor cerebri)***

There are 2 pathological effects of raised ICP :

- 1) decrease CPP resulting in cerebral ischemia***
- 2) distortion & herniation of the brain***

Symptoms & signs of raised ICP

- 1) headache (most common).*
- 2) vomiting.*
- 3) diplopia.*
- 4) ataxia.*
- 5) papilledema.*
- 6) 6th nerve palsy (false localizing sign).*
- 7) signs of brain herniation.*
- 8) hypertension, bradycardia&respiratory irregularities (cushing's response).*

Treatment of raised ICP

- 1) treatment of underlying cause (tumor resection, hematoma evacuation).*
- 2) head elevation with neck straight.*
- 3) ventricular drainage (external or internal).*
- 4) mannitol.*
- 5) hypertonic saline.*
- 6) loop diuretics (frusemide).*
- 7) steroid (dexamethzone) for chronic raised ICP .*
- 8) barbiturate coma using short acting barbiturate (thiopental).*

ICP monitoring

Indications:

- 1) GCS < 8.*
- 2) CT findings (operative or non operative).*
- 3) post-operative hematoma evacuation.*
- 4) high risk patients (above 40 years, hypotension, patients who require ventilation).*

Methods:

- A) non –invasive (clinical deterioration, transcranial Doppler, manual feeling of craniotomy flap or skull defect)*
- B) invasive (catheter connected to electrodes inserted intra ventricle, subdural space or intra-paenchymal).*